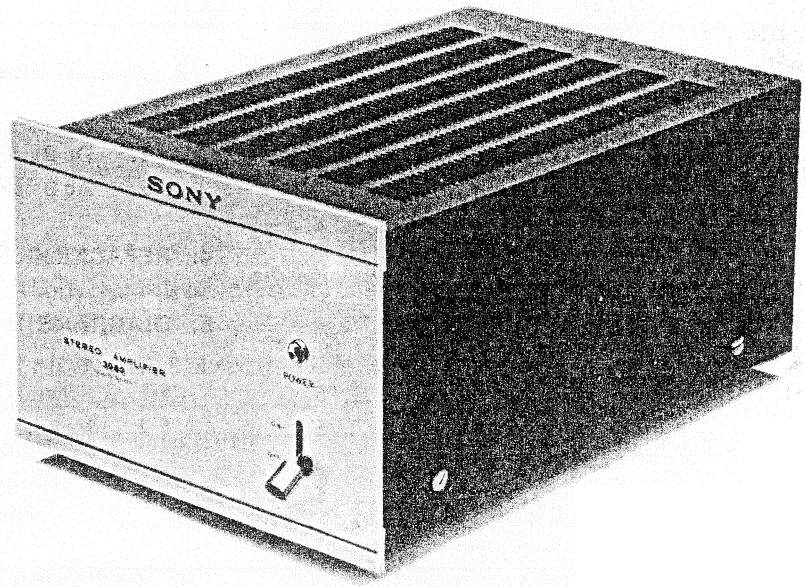
ISO

Set using ISO screws

TA-3060



SONY®

SERVICE MANUAL

TABLE OF CONTENTS

SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TA-3060 are given in Table 1.

TABLE 1. SPECIFICATIONS

Power Amplifier Section

Dynamic power output	:	70 watts both channels operating, 8 ohms (IHF)
Rated output	:	30 watts per channel, 8 ohms, both channels operating
Power bandwidth	:	6 Hz to 35 kHz, 8 ohms (IHF)
Harmonic distortion	:	Less than 0.1% at 1 kHz at rated output Less than 0.05% at 1 watt output (1 kHz)
IM distortion (60 Hz: 7 kHz=4:1)	:	Less than 0.2% at rated output Less than 0.03% at 1 watt output
Frequency response	:	5 Hz to 300 kHz +0 dB -2 dB at 1 watt output
Input sensitivity and impedance	:	0.9 V 100 k ohms
Residual noise	:	Less than 0.03 μW, 8 ohms
Signal to noise ratio	:	Greater than 110 dB (closed circuit)

General

Power requirement	:	100, 117, 220, 240 V ac 50/60 Hz
Power consumption	:	USA, CANADA 130 W General Export Model 175 W (IEC)
AC outlet	:	Unswitched, 300 watts maximum
Dimensions	:	7 7/8" (W) X 5 7/8" (H) X 12 7/16" (D) 200 (W) X 149 (H) X 316 (D) mm
Weight	:	5.8 kg (12 lb 13 oz)
Shipping weight	:	7.3 kg (16 lb.)

1-2. DETAILED CIRCUIT ANALYSIS

The following describes the functions of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 4 and schematic diagram on page 12.

Stage/Control	*Function*
LEVEL CONTROL (Variable attenuator) R101	Controls the input signal amplitude to obtain a desired output power.
Preamplifier Q101	Amplifies the input signal to the level required for the following driver stage. The ac output appears across load resistor R107 (2.2 k) in the collector circuit. Emitter decoupling capacitor is C102. C102 and resistor R104 in the emitter circuit form a frequency-selective ac bypass circuit to reduce the amplifier's gain at very low frequencies.
Thermal compensation D303, D101	As all the stages are directly coupled, dc stability is required. The negative temperature coefficient of D303 provides thermal compensation for this stage, and D101 compensates the following driver stage's operation. To obtain sufficient stability, dc negative feedback via R120, R105 and R106 and ac negative feedback via R120, R104, C107 and C102 are provided.
Ac balance adj.	Q101's emitter is connected to the negative power supply through R105 and R106 (ac balance adj.) To obtain the minimum harmonic distortion, R106 is adjusted to set the speaker terminal at zero volt dc.

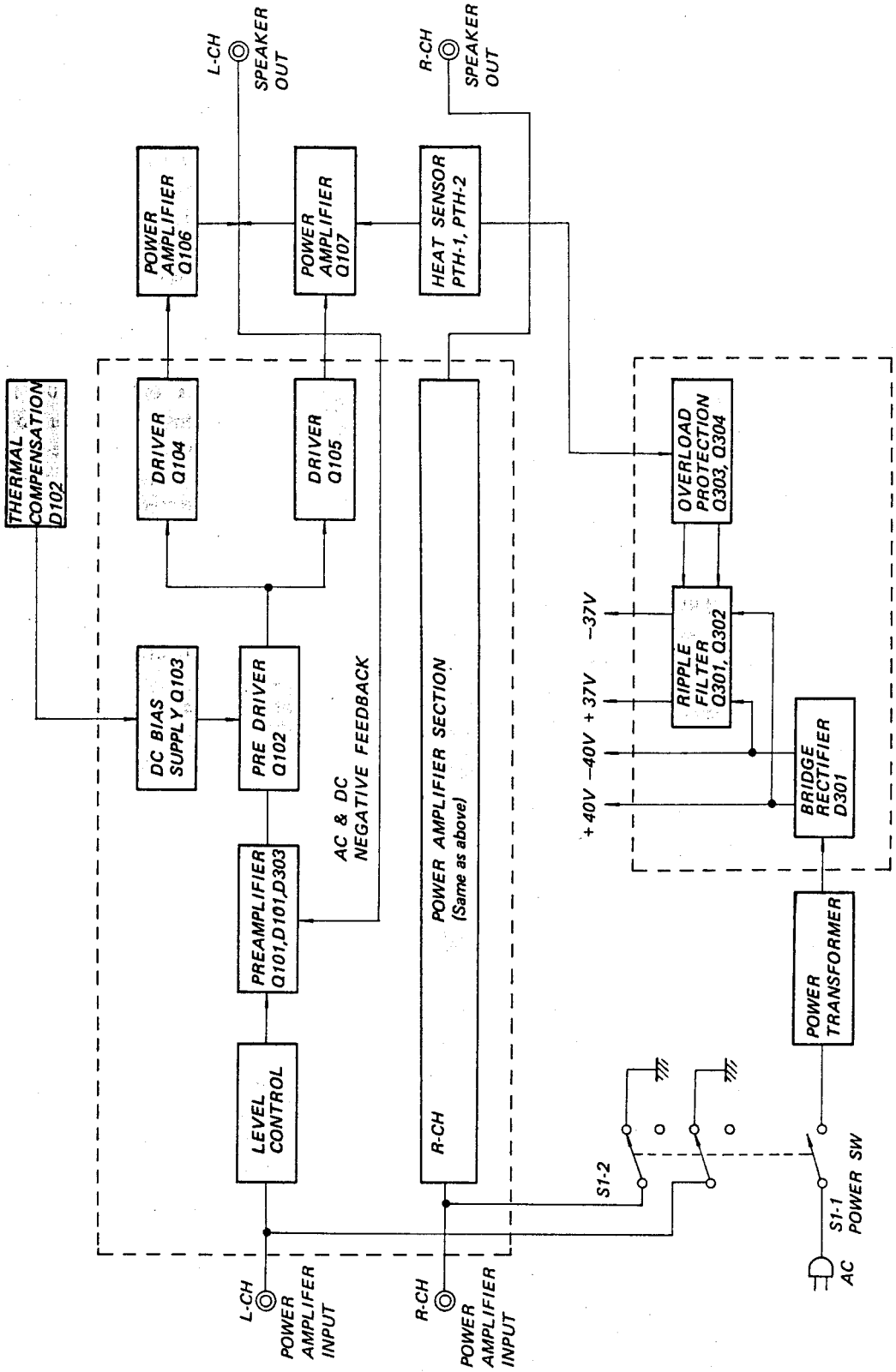
Stage/Control	*Function*
Predriver Q102	Though this stage is a conventional flat amplifier, it determines the output voltage swings because the following stages are basically in the emitter-follower configuration. The ac load resistor for this stage is R110. C104 forms a bypass circuit around Q103 to drive the Q104 effectively.
Dc bias adj. (Idling current) Q103, R109	Q103 is forced to conduct and operates as a small resistance providing the necessary forward bias on the two cascaded emitter-followers. R109 controls the base bias of Q103, determining the impedance between the emitter and collector of Q103, and thereby controls the dc bias voltage for the following driver circuit.
Thermal compensator for dc bias D102	The negative temperature coefficient of D102 provides thermal compensation for the driver and power transistor circuit. D102 is attached to the power transistor's heat sink to detect heat increase in the power transistors.
Driver Q104, Q105	These transistors operate as emitter-followers to provide the current swings demanded of the output stages and also provide the necessary phase inversion. Phase inversion is performed by using PNP and NPN type transistors. Resistors R112 and R118 in the collector circuit limit the maximum current flow (which occurs when the output is shorted) to protect the transistors from destruction.

Stage/Control	*Function*
Power supply rectifier D301	A full-wave bridge rectifier provides a positive and a negative dc power supply for the power amplifier.
Ripple filter Q301, Q302 R301, R303 C308, C310 C307, C309	These components reduce the ripple voltages in the dc power supply for the preamplifier and driver stages of the power amplifier section to an extremely-low value. Q301 and Q302 serve as an electronic filter to supply well filtered of about ±37.5 volts to each stage. The ripple filters also serve as a muting circuit and are part of the overload protection circuit.
Muting circuit R301, C308 (R303, C310)	"Popping" noise due to initial charging current flow to the electrolytic capacitor in the emitter circuit of Q101 is relatively small. R301 and C308 (R303 and C310) comprise an RC network with a long time constant. This eliminates popping because Q301 and Q302 are brought into conduction gradually when the POWER switch is turned on. On the other hand, when the POWER switch S1-1 is turned off, the input terminal is shorted to ground through a set of contacts on the POWER switch S1-2 making the shut-off operation noiseless.
Power transistor Q106, Q107	The output transistors (Q106 and Q107) are connected directly to a power supply of about ±40v potential. Q106 supplies power to the load during the positive half cycle and Q107 operates during the negative half cycle. As a result, the large coupling capacitor at the output (which may cause power loss or distortion

Stage/Control	*Function*
	at low frequencies) is eliminated.
R115, R116	R115 and R116 (0.5 ohm) are inserted in the output circuit of the power transistors to avoid nonlinear distortion and improve stability.
Heat-sensitive overload protection circuit Q303, Q304	To protect over loaded power transistors from destruction, a heat-sensitive protection circuit is employed. It operates as follows: Under normal conditions, voltage dividers consisting of resistors and posistors (resistors having a positive temperature coefficient) are arranged to place nearly zero bias on Q304, thereby cutting it off. Though the collector of Q304 is directly coupled to the base of Q302 (ripple filter), it has no effect upon Q302's operation. The same is true of Q303, which is connected to the base of Q301 (ripple filter) except for its bias circuit. The base of Q303 is connected to the positive and negative ripple filter output through R306 (10 k) and R307 (10 k) respectively. This places nearly zero bias upon Q303, and cuts it off. In the event of a short circuit at the output terminals or a thermal runaway, excessive current flows in the power transistors (for the amount of drive voltage supplied), causing the power transistors to overheat. The heat caused by excessive dissipation at the collectors of the power transistors is sensed by the posistor attached to the transistors. These posistors have a positive temperature coefficient so the heat causes their resistance to increase at some specified temperature.

Stage/Control	*Function*
	This places forward bias voltage on Q304. The two posistor are arranged as an OR gate, so a malfunction in either channel will be detected. Q304's turnon turns off Q302, thereby reducing the negative supply voltage, This also makes the positive supply voltage decrease because the reduction of negative supply voltage increases the positive bias voltage upon Q303, forcing it into conduction. As a result, Q301 turns off, cutting off power to the preamplifier and pre-driver stages. Now the driver stages cannot drive the power transistors despite an input signal. Since the output transistors are operated close to class B, the absence of drive reduces their collector current to practically zero.

1-3. BLOCK DIAGRAM



SECTION 2
DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The following tools and materials are required to perform disassembly and replacement procedures on the TA-3060.

Screwdriver
Phillips head screwdriver
Soldering iron, 30 to 50 watts
Solder, rosin core
Long-nose pliers
Diagonal cutters
Silicone grease
Nutdriver

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

Note: All screws in the TA-3060 are manufactured to the specifications of International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable. ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

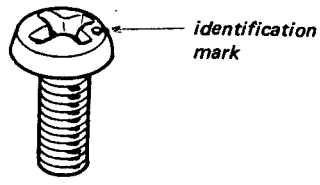
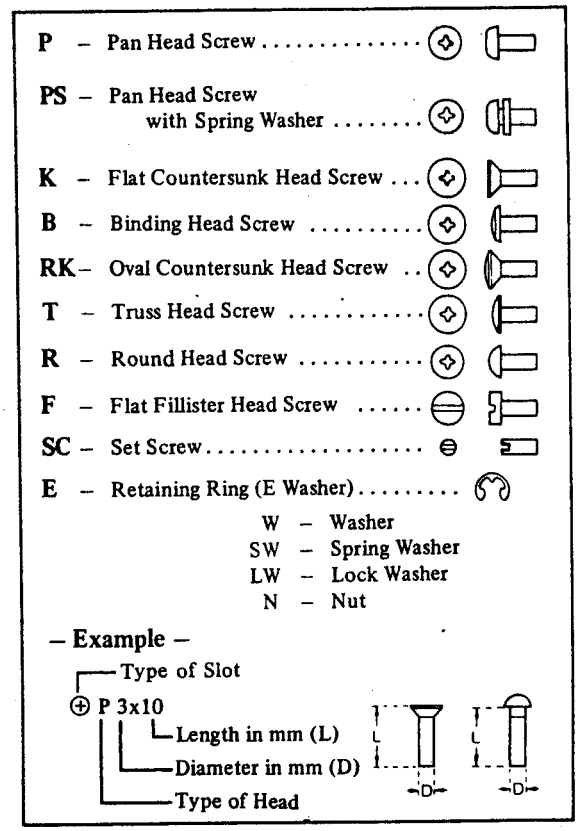


Fig. 2-1 ISO screw

— Hardware Nomenclature —



2-3. TOP COVER AND FRONT PANEL REMOVAL

1. Remove the four machine screws at each side of the set, and lift off the top cover.
2. Remove the two self-tapping screws (+R 3 X 6) at the front bottom side of the chassis. See Fig. 2-2.
3. Remove the POWER switch knob by pulling it out.
4. Remove the two screws (+PS 4 X 6) securing the front panel to the chassis from the back. See Fig. 2-3.

2-4. POWER SWITCH REPLACEMENT

1. Remove the front panel. See Procedure 2-3.
2. Remove the two screws (+P 3 X 6) securing the POWER switch to the chassis. Remove the switch.

3. Unsolder and remove the ac cord and encapsulated component from the defective switch.

4. Solder the cord and encapsulated component to the new switch.

5. Install the new switch.

2-5. PILOT LAMP REPLACEMENT

1. Remove the top cover. See Procedure 2-3.

2. Straighten the tab of the lamp socket bracket to permit removing the lamp.

3. Unscrew the lamp from the socket and install a new lamp.

4. Care should be taken not to lose the black lamp shade.

2-6. POWER TRANSISTOR REPLACEMENT

1. Remove the top cover. See Procedure 2-3.

2. Remove the four self-tapping screws (+R 3 X 6) securing the rear panel to the chassis from the bottom. See Fig. 2-4. Carefully tilt it backward and down.

3. Remove the four self-tapping screws (+R 3 X 6) that secure the heat sink to the chassis from the bottom. See Fig. 2-4.

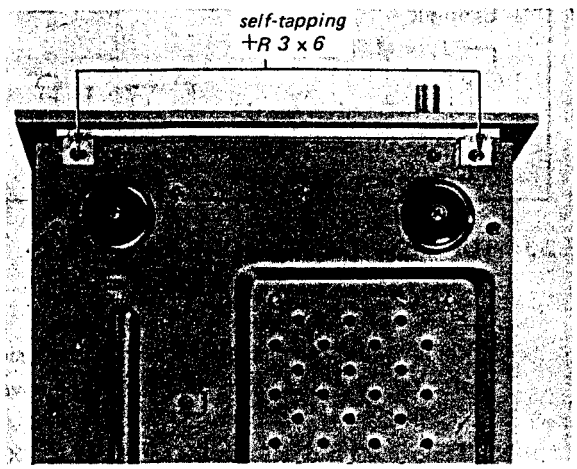


Fig. 2-2 Front panel removal (1)

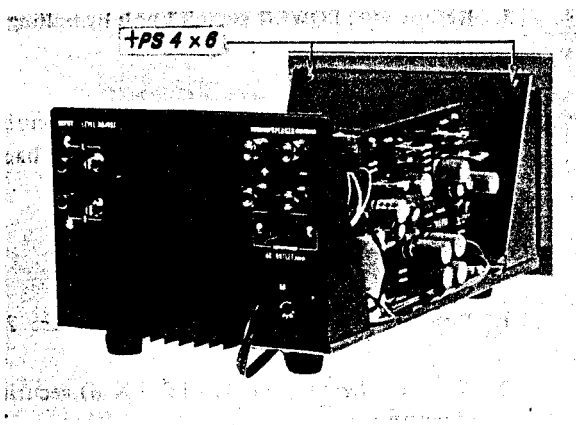


Fig. 2-3 Front panel removal (2)

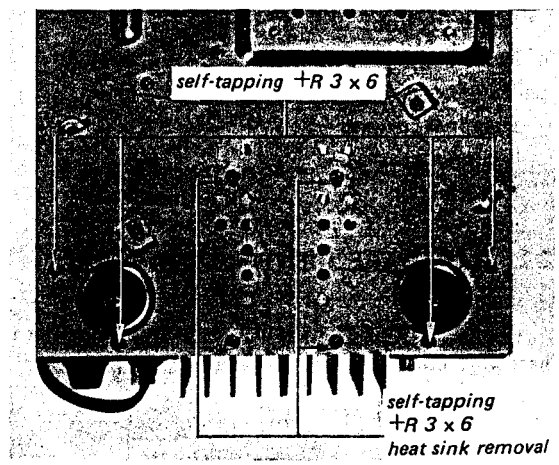


Fig. 2-4 Power transistor replacement (1)

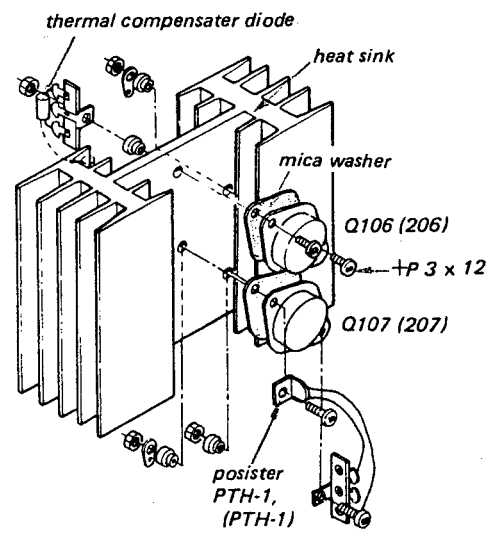


Fig. 2-5 Power transistor replacement (2)

3. Unsolder and remove the ac cord and encapsulated component from the defective switch.

4. Solder the cord and encapsulated component to the new switch.

5. Install the new switch.

2-5. PILOT LAMP REPLACEMENT

1. Remove the top cover. See Procedure 2-3.

2. Straighten the tab of the lamp socket bracket to permit removing the lamp.

3. Unscrew the lamp from the socket and install a new lamp.

4. Care should be taken not to lose the black lamp shade.

2-6. POWER TRANSISTOR REPLACEMENT

1. Remove the top cover. See Procedure 2-3.

2. Remove the four self-tapping screws (+R 3 X 6) securing the rear panel to the chassis from the bottom. See Fig. 2-4. Carefully tilt it backward and down.

3. Remove the four self-tapping screws (+R 3 X 6) that secure the heat sink to the chassis from the bottom. See Fig. 2-4.

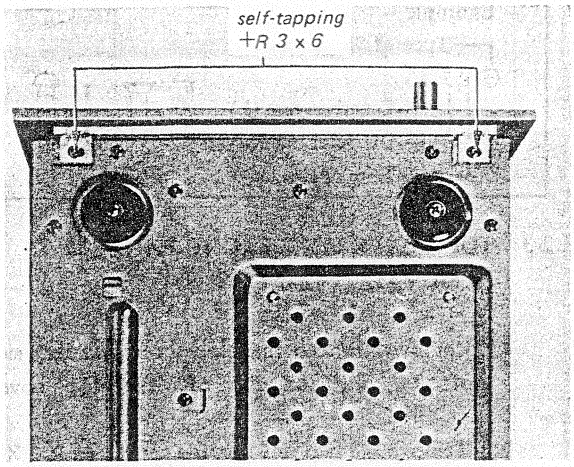


Fig. 2-2 Front panel removal (1)

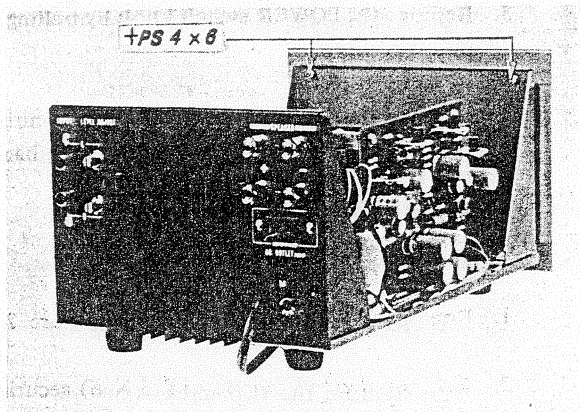


Fig. 2-3 Front panel removal (2)

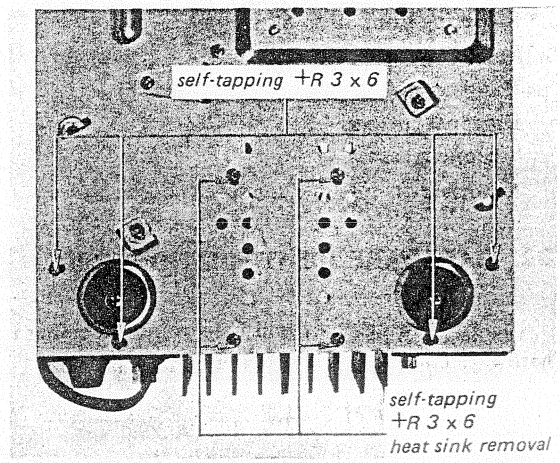


Fig. 2-4 Power transistor replacement (1)

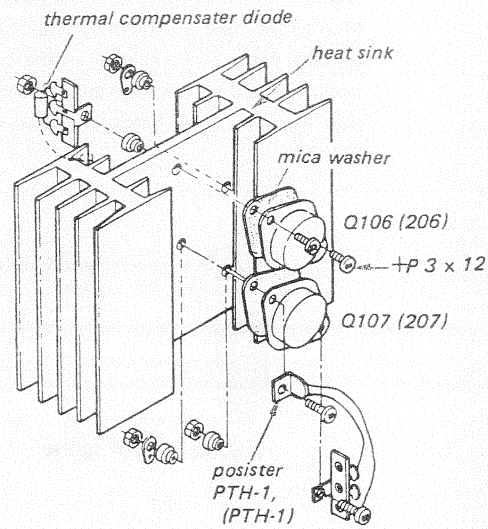


Fig. 2-5 Power transistor replacement (2)

4. Remove the defective power transistor by loosening the two screws (+P 3 X 12) securing it to the heat sink. See Fig. 2-5.

5. When replacing the power transistor, apply a coating of heat-transferring silicone grease to both sides of the insulating mica washer. The grease fills in any tiny gaps between the mating surfaces, thereby improving the heat transfer to the heat sink.

6. Any excess grease, squeezed out when the mounting bolts are tightened should be wiped off with a clean cloth to prevent the accumulation of conductive dust particles that might eventually cause a short.

2-7. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY RIVETS

1. Remove the rivets securing the defective component as follows:

   (a) Remove the rear panel, then bore out the rivet using a drill bit slightly larger in diameter than the rivet. See Fig. 2-6.

   (b) When the peened end is bored away, push out the remainder of the rivet.

2. Remove the defective component and then install a new one.

3. Secure the new component with a suitable screw and nut.

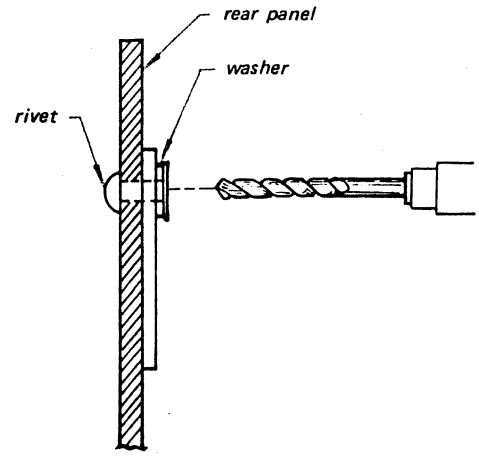


Fig. 2-6 Revet replacement

2-8. CHASSIS LAYOUT

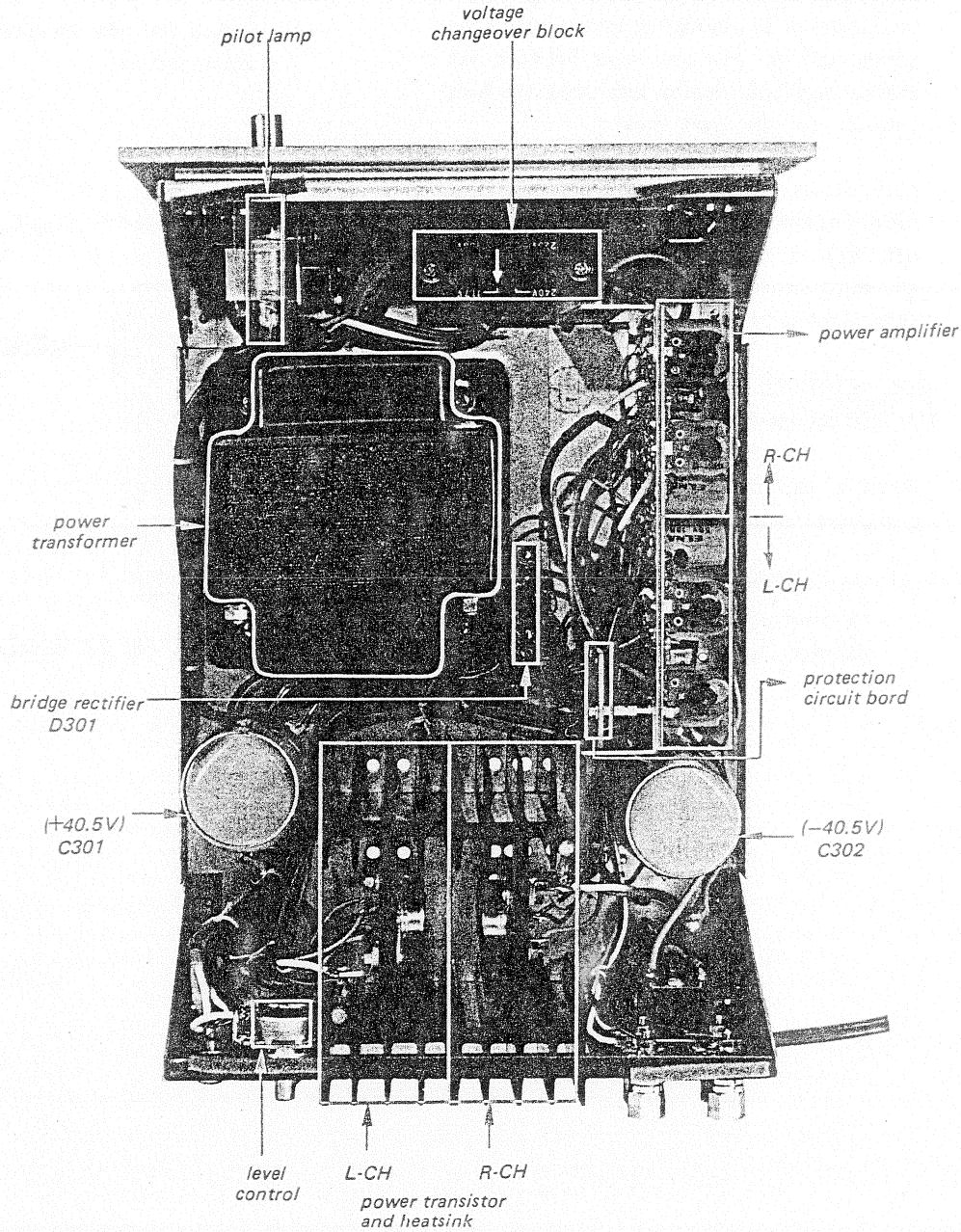


Fig. 2-7 Chassis layout

SECTION 3
ADJUSTMENTS

Note: There are two adjustment items in the power amplifier. One is dc-bias adjustment and the other is ac-balance adjustment. These adjustments should be alternately repeated two or three times after replacing any of the power transistors until the best operation is obtained.

3-1. DC BIAS ADJUSTMENT

Serious deficiencies in performance, such as thermal runaway of power transistors, will result if this adjustment is improperly set.

CAUTION

To avoid accidental power transistor damage, increase the ac line voltage gradually, using a variable transformer, while measuring the voltage across emitter resistors R115, and R116 (or R215 and R216) as shown in Fig. 3-1. Check to see that the reading does not exceed 50 mV. If it does, turn off the power immediately, then check and repair the trouble in the power-amplifier board.

Test Equipment Required

1. Dc millivoltmeter
2. Variable transformer
3. Screwdriver with 3mm (1/8″) blade

Preparation

1. Remove the top cover as described in Procedure 2-3.

2. Connect the dc millivoltmeter between R115 and R116 (R215 and R216) as shown in Fig. 3-1.

Procedure

1. Apply a drop of cement solvent to the semifixed resistors (Fig. 3-1) on the power-amplifier board, and then wait a few seconds for the cement to dissolve.

2. Set the semifixed resistors as follows:

   R109 (L-CH, dc bias) . . . . . fully counter-clockwise
   R209 (R-CH, dc bias) . . . . . fully clockwise
   R106, R206 (ac balance) . . . . midposition

3. Set the variable transformer for minimum output.

4. Turn the POWER switch, then increase the line voltage up to the rated value.

5. Adjust R109 (R209) to obtain a 50 mV reading on the meter.

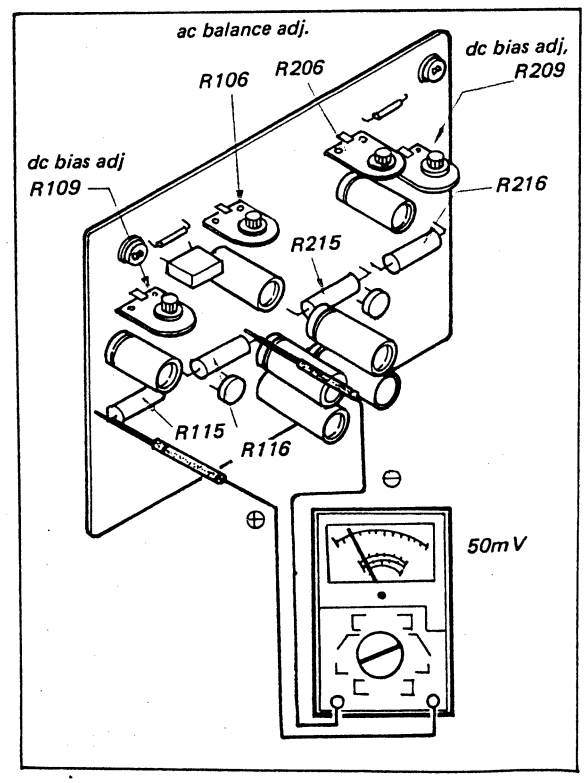


Fig. 3-1 Connection of dc voltmeter across R115 and R116

3-2. AC BALANCE ADJUSTMENT

Excessive harmonic distortion at high levels will result if this adjustment is improperly set.

Test Equipment Required

1. Dc null meter or dc millivoltmeter
2. Screwdriver with 3mm (1/8″) blade

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Connect the dc null-meter or dc milli voltmeter to the speaker output terminal.

Procedure

1. Apply a drop of cement solvent to R106 (R206) and wait a few seconds for the lock paint to dissolve.
2. Turn the POWER switch to ON and then adjust the R106 (R206) to obtain a 0 volt reading on the meter.
3. After 10 minutes warm-up alternately repeat this and the dc bias adjustment two or three times.
4. After completing the adjustment, apply a drop of lock paint to R109 and R106 (R209 and R206).

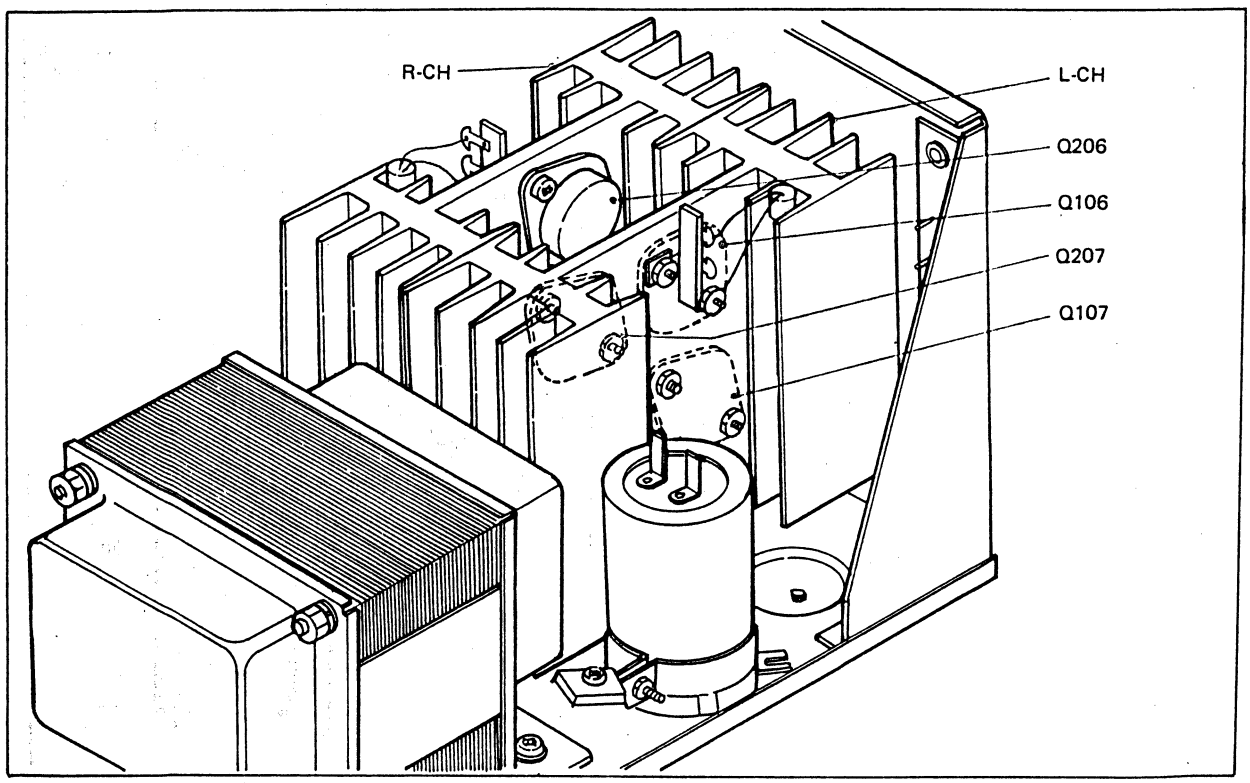


Fig. 3-2 Location of power transistors

SECTION 4
REPACKING

The TA-3060's original shipping carton and packing material is the ideal container for shipping the unit.

However, to secure the maximum protection, the TA-3060 must be repacked in this material precisely as before. The proper repacking procedure is shown in Fig. 4-1.

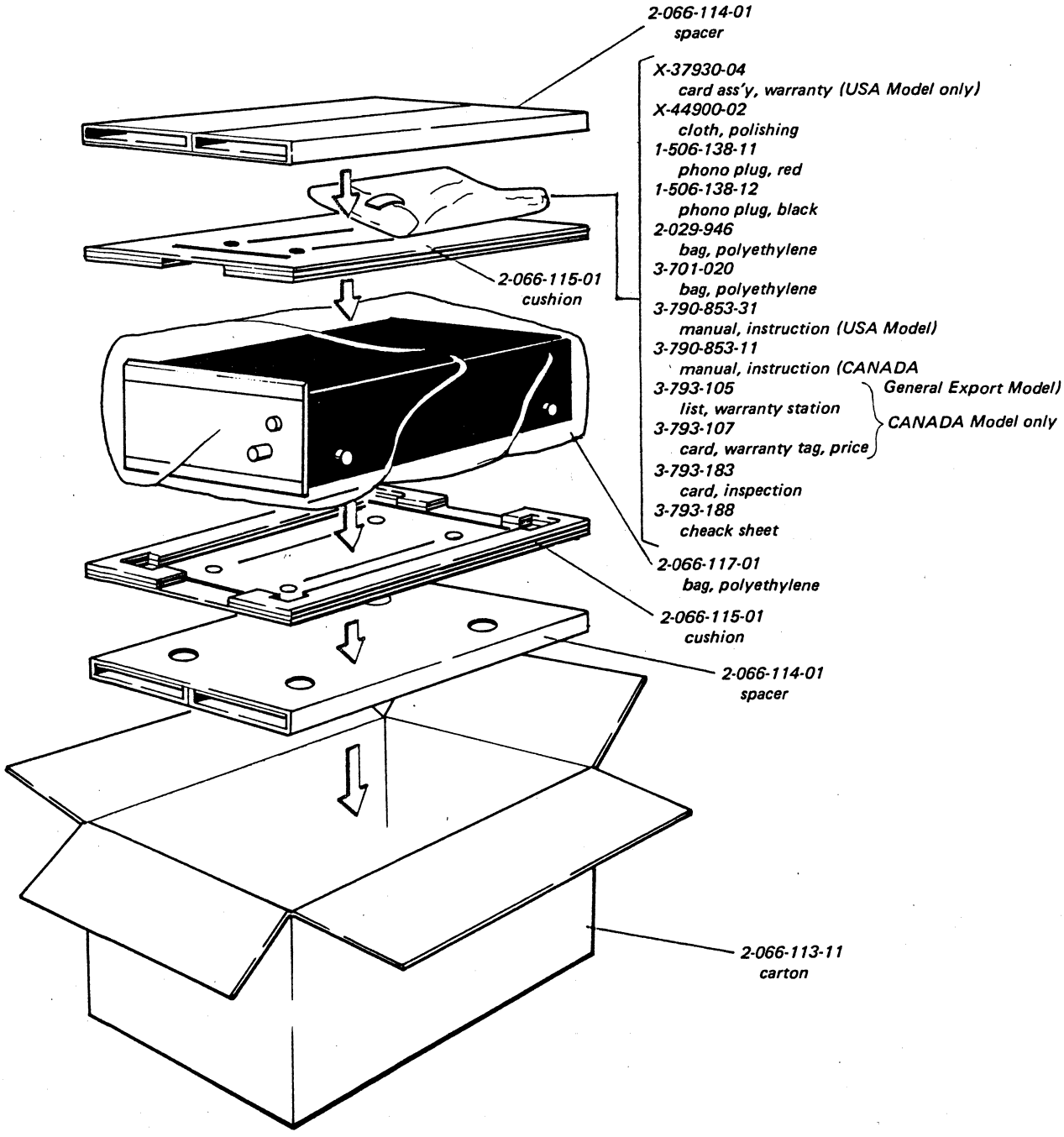
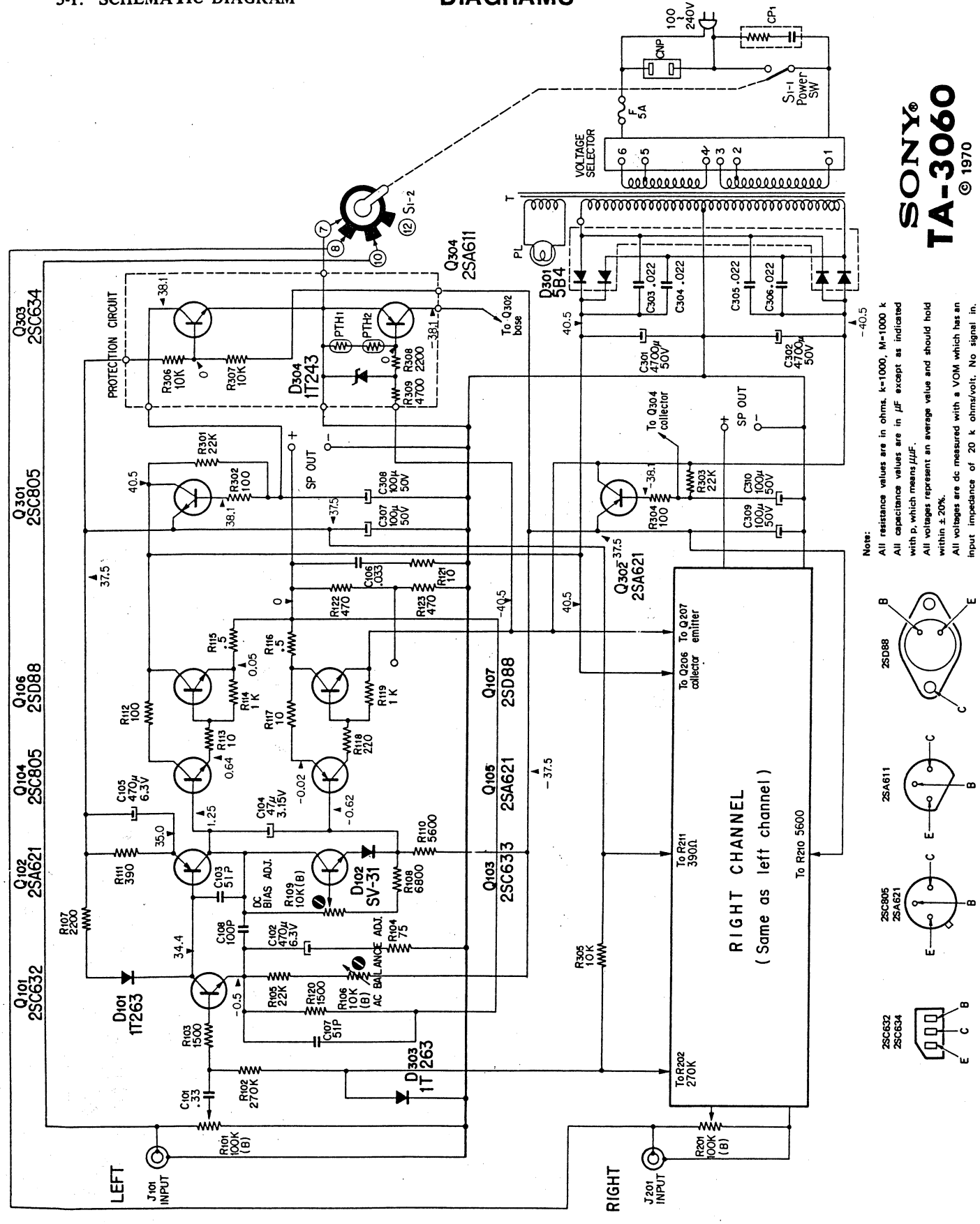


Fig. 4-1 Repacking

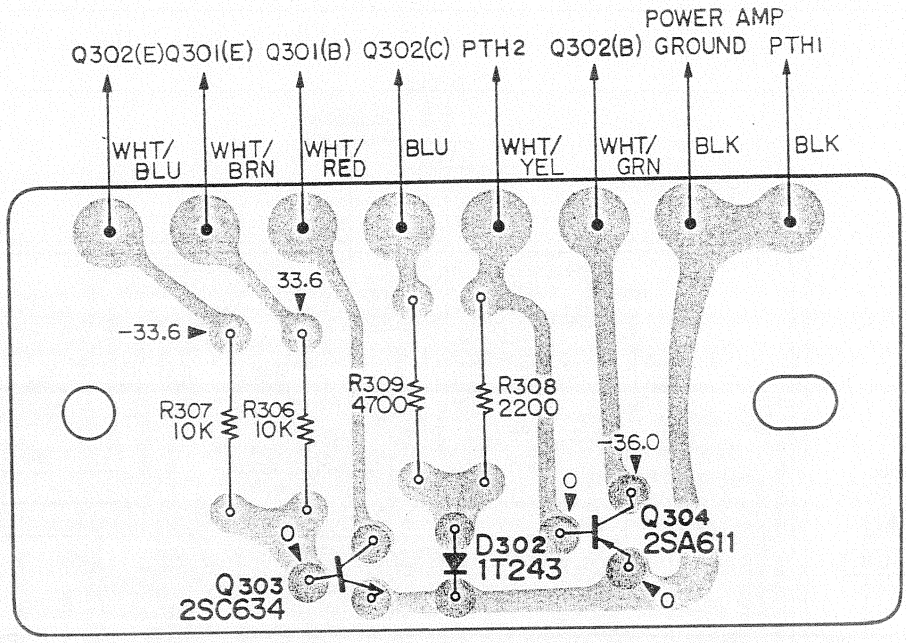
SECTION 5
DIAGRAMS

5-1. SCHEMATIC DIAGRAM

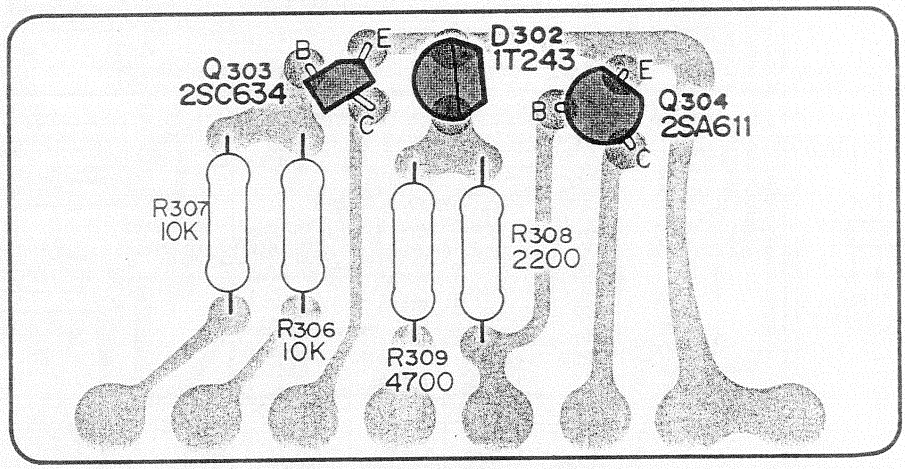


5-2. MOUNTING DIAGRAM–Protection Circuit Board

–Conductor Side–

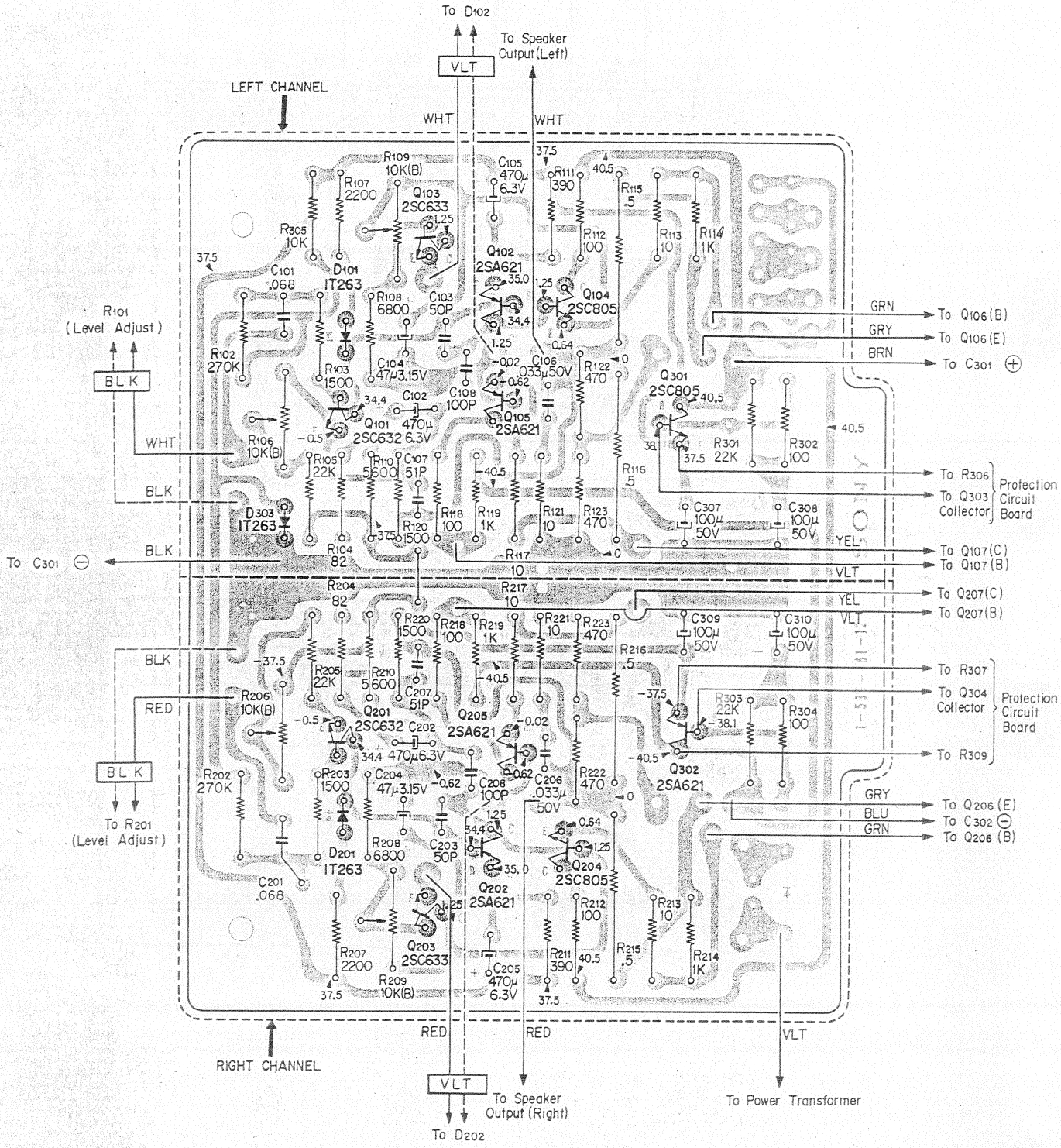


–Component Side–



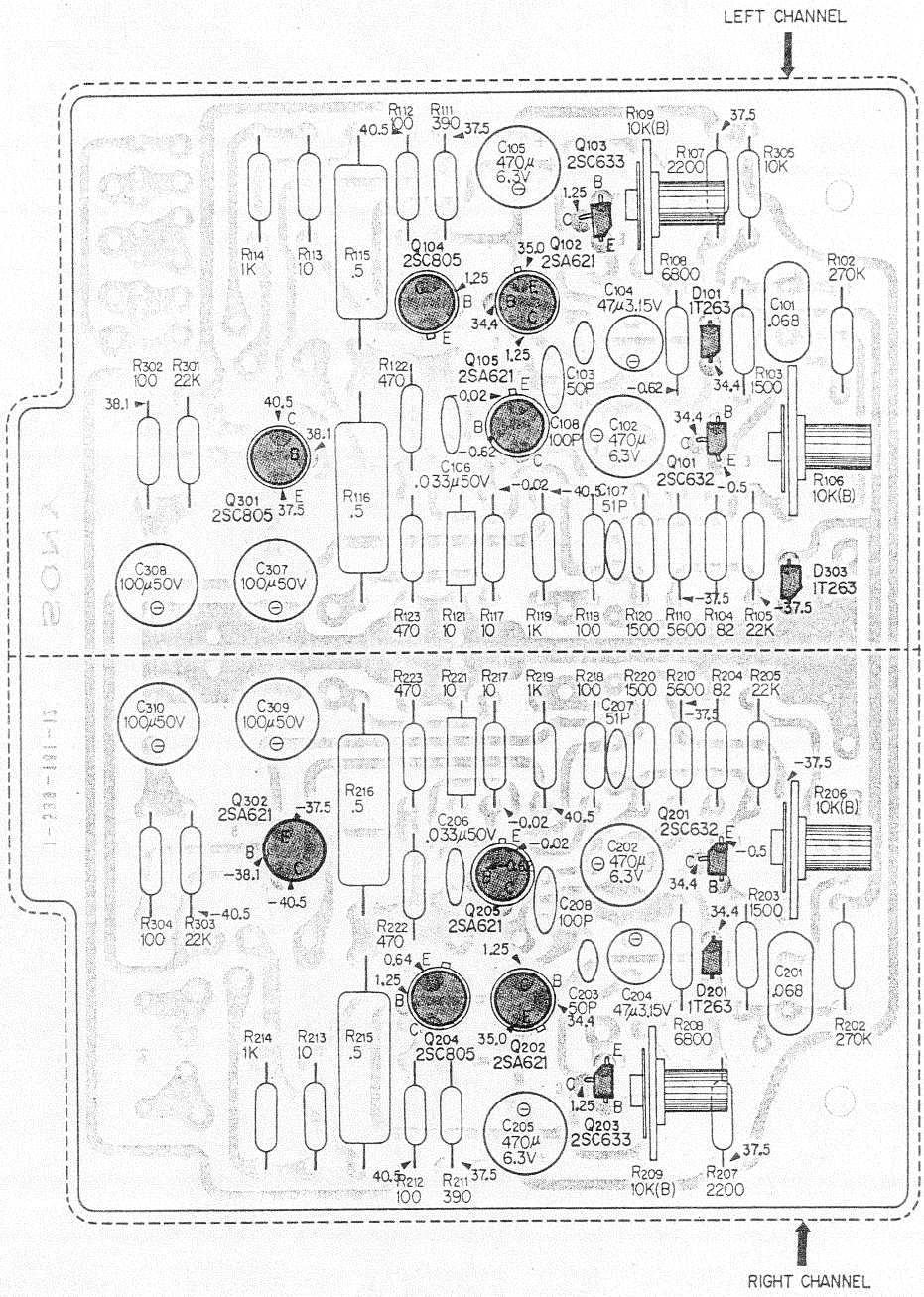
5-3. MOUNTING DIAGRAM–Power Amplifier Board

–Conductor Side–

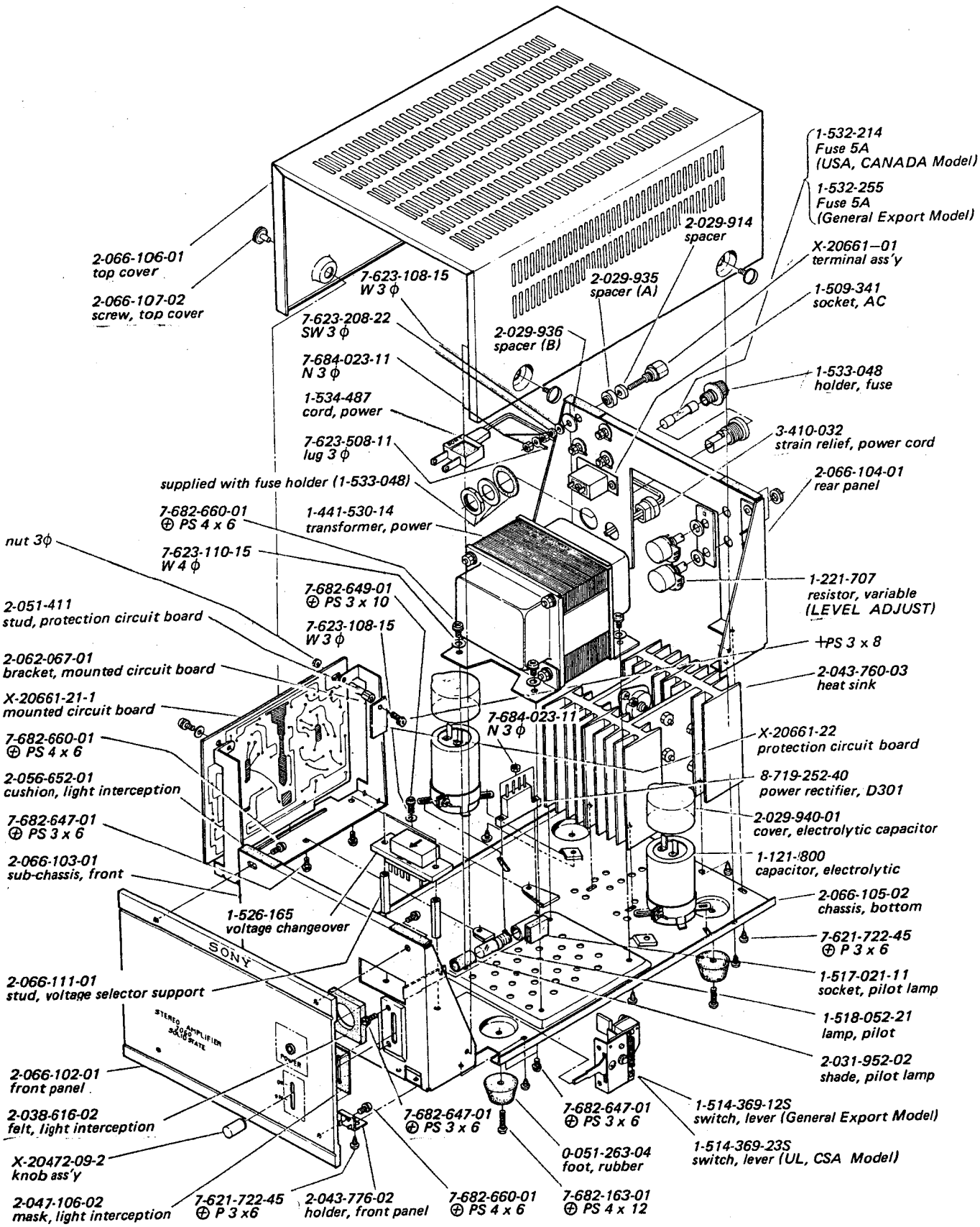


5-3. MOUNTING DIAGRAM–Power Amplifier Board

–Component Side–



SECTION 6
EXPLODED VIEW



PS = pan head screw with spring washer

SECTION 7
ELECTRICAL PARTS LIST

Mounted Circuit Boards

Ref. No.	Part No.	Description
	X-20661-21	power amplifier circuit board
	X-20661-22	protection circuit board

Semiconductors

Ref. No.	Part No.	Description
D101(D201)		diode, 1T263
D102(D202)		diode, SV-31
D301		diode, 5B4
D303		diode, 1T263
D304		diode, 1T243M
PTH 1	1-800-064	posistor
PTH 2	1-800-064	posistor
Q101(Q201)		transistor, 2SC632
Q102(Q202)		transistor, 2SA621
Q103(Q203)		transistor, 2SC633
Q104(Q204)		transistor, 2SC805
Q105(Q205)		transistor, 2SA621
Q106(Q206)		transistor, 2SD88
Q107(Q207)		transistor, 2SD88
Q301		transistor, 2SC805
Q302		transistor, 2SA621
Q303		transistor, 2SC634
Q304		transistor, 2SA611

Transformer

Ref. No.	Part No.	Description
	1-441-530-14	transformer, power

Capacitors

All capacitance values are in μF except as indicated with P, which means μμF.

Ref. No.	Part No.				
C101(C201)	1-105-691-12	0.33	±10%	50V	mylar
C102(C202)	1-121-359	470	$\pm^{100}_{10}$%	6.3V	electrolytic
C103(C203)	1-107-124	51p	±10%	50V	silvered mica
C104(C204)	1-121-287	47	$\pm^{100}_{10}$%	3.15V	electrolytic
C105(C205)	1-121-359	470	$\pm^{100}_{10}$%	6.3V	electrolytic
C106(C206)	1-105-679-12	0.033	±10%	50V	mylar
C107(C207)	1-107-124	51p	±10%	50V	silvered mica
C108(C208)	1-107-131	100p	±10%	50V	silvered mica
C301	1-121-800	4700	$\pm^{100}_{10}$%	50V	electrolytic
C302	1-121-800	4700	$\pm^{100}_{10}$%	50V	electrolytic
C303	1-105-877-12	0.022	±20%	100V	mylar
C304	1-105-877-12	0.022	±20%	100V	mylar
C305	1-105-877-12	0.022	±20%	100V	mylar
C306	1-105-877-12	0.022	±20%	100V	mylar
C307(C310)	1-121-384	100	$\pm^{100}_{10}$%	50V	electrolytic
C308(C309)	1-121-384	100	$\pm^{100}_{10}$%	50V	electrolytic

Resistors

All resistance values are in ohms, ±5%, 1/4 watts and carbon type unless otherwise indicated.

Ref. No.	Part No.				
R101(R201)	1-221-707	100K (B)			variable
R102(R202)	1-244-731	270K			
R103(R203)	1-244-677	1.5K			
R104(R204)	1-244-646	75			
R105(R205)	1-244-705	22K			
R106(R206)	1-221-967	10K (B)			semi-fixed
R107(R207)	1-244-681	2.2K			
R108(R208)	1-244-693	6.8K			
R109(R209)	1-221-967	10K (B)			semi-fixed
R110(R210)	1-244-691	5.6K			
R111(R211)	1-244-663	390			
R112(R212)	1-244-649	100			
R113(R213)	1-244-625	10			
R114(R214)	1-244-673	1K			
R115(R215)	1-207-151	0.5	±10%	1.5W	wire-wound
R116(R216)	1-207-151	0.5	±10%	1.5W	wire-wound
R117(R217)	1-244-625	10			
R118(R218)	1-202-557	220	±10%	1/2W	composition
R119(R219)	1-244-673	1K			
R120(R220)	1-244-677	1.5K			
R121(R221)	1-202-525	10	±10%	1/2W	composition
R122(R222)	1-244-665	470			
R123(R223)	1-244-665	470			
R301(R303)	1-244-705	22K			
R302(R304)	1-244-649	100			
R305	1-244-697	10K			
R306	1-244-697	10K			
R307	1-244-697	10K			
R308	1-244-681	2.2K			
R309	1-244-689	4.7K			

Switch

Ref. No.	Part No.	Description
S1	1-514-369-12S	switch, lever (POWER) General Export Model
	1-514-369-23S	switch, lever (POWER) USA, CANADA Model

Ref. No.	Part No.	Description
	Miscellaneous	
	1-231-057-12	encapsulated component, 120Ω + 0.033μF
	1-507-142-13	phono jack, 2-p
	1-509-015	ac outlet (General Export Model)
	1-509-341-12	ac outlet (USA, CANADA Model)
	1-517-021	socket, pilot lamp
	1-518-052-21	lamp, pilot
	1-526-165	voltage changeover block
	1-532-214	fuse 5A (USA, CANADA Model)
	1-532-255	fuse 5A (General Export Model)
	1-533-048	holder, fuse
	1-534-487-22	cord, power (General Export Model)
	1-534-526-21	cord, power (USA, CANADA Model)
	1-536-179	terminal strip, 1L1 (C)

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